

### REMARKS

Claims 1-7, 10-19 and 21-23 are pending in the present application. Claims 8, 9 and 20 have been cancelled. Claims 1-2, 4, 10-12 and 21 have been amended. New Claims 22-23 have been added. Support for the amendments and new claims can be found throughout the specification, and in particular on pages 5-12 of the specification. Applicants respectfully request reconsideration of the present claims in view of the following remarks.

The specification was amended to include the dimensions of some of the listed commercial fibers. These dimensions are inherent to the respective brand of fiber, and thus do not introduce new matter.

#### I. Formal Matters:

##### Rejection of Claims 1-6, 10-12, 17-19 and 21 under 35 U.S.C. § 112, P1

The Examiner rejected Claims 1-6, 10-12, 17-19 and 21 under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification in such a way as to convey that Applicants had possession of the claimed invention. This rejection is respectfully traversed.

It is respectfully submitted that lauryldimethyl amine oxide has more than one functional group. Lauryldimethylamine oxide is a known cationic/nonionic surfactant. This means that this surfactant has both cationic and nonionic functional groups. The cationic functional group can react with anionic and other functional groups on the surface of a superabsorbent material. The nonionic functional group is non-reactive. The cationic/nonionic nature of lauryl dimethylamine oxide is listed on page 679 of The Handbook of Industrial Surfactants, enclosed as "Exhibit A."

Applicants respectfully submit that the chemical structure  $\text{CH}_3(\text{CH}_2)_{11}\text{N}(\text{CH}_3)_2\text{O}$ , as denoted by chemical registry number, RN# 1643-20-5, results in a monovalent oxygen which is inconsistent with the chemical valence of oxygen. Oxygen is divalent. Applicants submit that the proposed structure is most likely  $\text{CH}_3(\text{CH}_2)_{11}\text{N}(\text{CH}_3)_2\text{OH}$  or  $[\text{CH}_3(\text{CH}_2)_{11}\text{N}(\text{CH}_3)_2]_2\text{O}$ . However, even if the chemical structure of lauryldimethylamine oxide is denoted as  $\text{CH}_3(\text{CH}_2)_{11}\text{N}(\text{CH}_3)_2\text{O}$ , this compound still contains two functional groups, an oxide group and an amine group. The oxide group is a hydrophilic, but non-reactive, functional group that is widely used as a hydrophilic functional group in the surfactant industry. The amine group is both reactive and hydrophilic. The amine group can react with a carboxylic acid, and when the amine

is in the protonated state, carboxyl groups, both on the surface of the superabsorbent polymer. It is noted that anhydride groups on a polymer are hydrolyzed to form carboxyl groups and carboxylic acid groups before the polymer is spun into a fiber. In the present invention, the amine reacts with the functional groups at the surface of the polymer, and the oxide remains at the surface of the treated polymer to enhance wettability by, for example, hydrogen bonding to polar molecules, such as water molecules. Thus, it is respectfully submitted that Applicants did have possession of the claimed invention at the time the application was filed. Therefore, Applicants respectfully request the withdrawal of this rejection.

Rejection of Claim 21 under 35 U.S.C. § 112, P1

The Examiner rejected Claim 21 under 35 U.S.C. § 112, first paragraph, as lacking enablement for processes where the superabsorbent material is in a solvated state. This rejection is respectfully traversed.

Claim 21 has been amended to recite that the surface of the superabsorbent material is sufficiently solvated. Support for this amendment can be found on pages 2, 5 and 7 of the specification. It is clear from the specification that the term "solvate" is used to describe a state in which the surface groups are surrounded by water molecules so as to form a partially soluble state at the surface of the superabsorbent material. This solvate state at the surface allows for the free rotation of the functional groups on the surface of the superabsorbent material. Applicants respectfully request the withdrawal of this rejection.

Rejection of Claims 1-6, 10-12, 17-19 and 21 under 35 U.S.C. § 112, P2

The Examiner rejected Claims 1-6, 10-12, 17-19 and 21 under 35 U.S.C. § 112, second paragraph, for failing to particularly point out and distinctively claim the subject matter which applicant regards as the invention. This rejection is respectfully traversed.

The Examiner rejected Claim 1, finding that the only identified surfactant in the specification did not meet the limitations of what was described as the surfactant in Claim 1. This is respectfully traversed. As described above, lauryldimethyl amine oxide has at least two functional groups that satisfy the claimed features of Claim 1. Accordingly, Applicants respectfully request the withdrawal of this rejection. ND

The Examiner rejected Claim 2 as indefinite, because it was unclear how much water was needed to solvate the surface. Claim 2 has been amended in line with

the Examiner's suggestion. As such, Applicants respectfully request the withdrawal of this rejection.

The Examiner rejected Claims 10-12 as indefinite, for use of the following terms and related terms: "floating time" and "a reduction in surface tension of saline less than about 30%." The Examiner found that these phrases were indefinite because the saline was not defined and the conditions of the test were not specified. Claims 10-12 have been amended to recite that the superabsorbent material is a fiber. The saline is defined as 0.9% NaCl saline on pages 10-11 of the specification. Additionally, the conditions of the test are specified on pages 10-11 of the specification. Although Applicants have amended Claims 10-12, Applicants respectfully submit that their tests to determine floating time and surface tension were designed to cover a range of material dimensions. The floating time test was applied to superabsorbent particles having a dimension of 300-600  $\mu\text{m}$ , as opposed to fiber dimensions of around 20  $\mu\text{m}$ , and the test worked fine in differentiating hydrophobic surfaces from hydrophilic surfaces. Applicants respectfully request the withdrawal of this rejection.

## II. Prior Art Rejections:

The Examiner rejected Claims 1, 4, 6, 10-12, 19 and 21 under 35 U.S.C. § 102 (b) as anticipated by, or in the alternative under 35 U.S.C. § 103 (a) as obvious over, U.S. Patent No. 3,989,586 to Bashaw et al. (hereafter "Bashaw"). This rejection is respectfully traversed.

Claim 1 is directed to a method of making a permanently wettable superabsorbent material, comprising treating the superabsorbent material with a surfactant solution and binding the surfactant to the surface of the superabsorbent material. The surfactant has at least one first functional group reactive with a second functional group of the superabsorbent material, and at least one non-reactive, hydrophilic functional group. The surfactant is applied to the superabsorbent material when the surface of the superabsorbent material is activated by increasing the amount of second functional groups available to react at the surface of the superabsorbent material. Applicants respectfully submit that Bashaw does not teach or suggest a method of making a permanently wettable superabsorbent material.

Bashaw does not teach or suggest the activation of the surface of a superabsorbent material to promote the chemical interactions between surfactant functional groups and functional groups on the surface of the superabsorbent material.

functional groups and functional groups on the surface of the superabsorbent material. Activation of the surface of a superabsorbent material increases the amount of functional groups at the surface available to form bonds with the reactive functional group of the surfactant. The surface of a commercial superabsorbent fiber is very hydrophobic, indicating there is almost no available functional groups available at the surface to react with the surfactant. Surface hydrophobization results when a drawn fiber is dried in hot air (see page 4 of the specification). An activation agent, such as a minor amount of water present in another solvent, is used to effectively achieve this surface activation. Bashaw teaches the pulverization of the copolymer in an attrition mill. Pulverization may produce new surface area, but it does not modify the old/previous surface. Pulverization does not result in the selective activation of functional groups on the surface of the copolymer as opposed to the interior of the polymer. Bashaw also teaches the coagulation of a copolymer/acetone gel or copolymer/methylethyl ketone gel in methanol. Coagulation of these copolymer gels in methanol does not activate the surface of the copolymer with respect to the interior regions of the copolymer, since there is never a surface hydrophobization to begin with. Acetone, methylethyl ketone and methanol are hydrophilic solvents. Thus, during the formation of the copolymer and during its coagulation, both the interior and the surface of the copolymer are exposed to a hydrophilic environment. Coagulation in methanol does not increase the amount of hydrophilic functional groups at the surface with respect to the interior of the copolymer. Pulverization and coagulation are not activating processes. Moreover, these methods are not applicable to superabsorbent fibers because these methods would change/destroy the physical form of the fiber. Without surface activation, sufficient chemical binding between the surfactant functional groups and the surface functional groups on the superabsorbent material cannot be achieved. Without sufficient binding, a permanent wettable superabsorbent material cannot be achieved.

Applicants also submit that Bashaw fails to teach or suggest a permanently wettable superabsorbent material for the following reasons. Bashaw teaches that the copolymer is treated with an alkaline agent to convert the polymer into a water-swellaable salt form. This treatment would interfere with the ionic bounds formed between the surfactant functional groups and the surface functional groups on the superabsorbent material. For example, under alkaline conditions, protonated amine group of the surfactant ( $\text{NR}_3\text{H}^+$ ) is deprotonated to amine ( $\text{NR}_3$ ). Both ammonia and an alkali metal hydroxide will compete for hydronium ions, resulting in the displacement of ionic bonds formed by the surfactant. The deprotonation of the surfactant amine causes ionic bonds

become fugitive. Fugitive surfactant on the surface of a superabsorbent material dramatically reduces the surface tension of fluid that comes in contact with the superabsorbent material, and thus dramatically reduces the material's wettability and fluid wicking ability through the capillary channels due to low surface tension. Thus, the Bashaw reference teaches away from a method of forming a permanently wettable superabsorbent material. Moreover, Bashaw fails to teach or suggest the selective removal of fugitive surfactant from the surface of the superabsorbent material. Fugitive material will remain on the copolymer unless the copolymer is washed in a solvent that can dissolve the surfactant. Again, fugitive surfactant on the surface of a superabsorbent material dramatically reduces its wettability. Thus, Bashaw does not teach or suggest a method of forming permanently wettable superabsorbent material.

For at least the reasons given above, Applicants respectfully submit that Claim 1 is allowable over the art of record. Furthermore, since Claims 4, 6, 10-12, 19 and 21 recite additional claim features and depend from Claim 1, these claims are also allowable over the art of record. Accordingly, Applicants respectfully request the withdrawal of this rejection.

The Examiner rejected Claims 2-3, 5 and 17 under 35 U.S.C. § 103 (a) as unpatentable over Bashaw in view of U.S. Patent No. 5,223,026 to Schwarz, Jr. (hereafter "Schwarz, Jr."), as evidenced by the ACS Registry file. The Examiner found that Bashaw did not disclose the inclusion of an alcohol in the treatment with the surfactant, but that Schwarz, Jr. makes up for this deficiency by disclosing commercially available surfactants in alcohol solutions. This rejection is respectfully traversed.

Applicants respectfully submit that the combination of Bashaw and Schwarz, Jr. does not teach or suggest a method of making a permanently wettable superabsorbent material. Neither reference teaches or suggests the activation of the surface of the superabsorbent material. Moreover, neither reference teaches or suggests superabsorbent materials in which bound surfactant remains bound and fugitive surfactant is selectively removed. In Schwarz, Jr., the disclosure of surfactants sold in alcoholic solutions does not remove these deficiencies.

For at least the reasons given above, Applicants respectfully submit that Claim 1 is allowable over the art of record. Furthermore, since Claims 2-3, 5 and 17 recite additional claim features and depend directly or indirectly from Claim 1, these claims are also allowable over the art of record. Accordingly, Applicants respectfully request withdrawal of this rejection.

**Marked-up Version to Show Changes Made to Specification**

Pursuant to 37 CFR §1.121(b), the following replacement paragraphs and sections show all the changes made by the foregoing amendment relative to the previous version of the specification, with deleted text shown in [brackets] and added text shown in underlining:

The paragraph beginning on page 6, line 16, and ending on page 6, line 21, was replaced with the following:

In one embodiment of the present invention, the absorbent fibers comprise one or more superabsorbent materials in the form of a sodium salt of a cross-linked polymer. Such superabsorbent materials include, but are not limited to, Fiberdri® 1161, Fiberdri® 1231, and Fiberdri® 1241 (all available from Camelot Superabsorbent Ltd. of Calgary, Canada); and Oasis® 101, Oasis® 102, and Oasis® 111 (all available from Technical Absorbents, UK). The Fiberdri® 1161 and 1241 fibers have a diameter around 20 microns and a length around two centimeters. Some other types of Fiberdri® superabsorbent fibers have a length around four centimeters.

**Marked up version of re-written claims**

Pursuant to 37 CFR §1.121(c)(1)(ii), another version of the rewritten claims marked up to show all the changes relative to the previous version of the claims is now set forth with deleted text shown in [brackets] and added text shown in underlining:

1. (Amended) A method of making a permanently wettable superabsorbent material, comprising:

treating the superabsorbent material with a surfactant solution ;

binding the surfactant to the surface of the superabsorbent material; and

wherein the surfactant has at least one first functional group reactive with a second functional group [of] on the surface of the superabsorbent material, and at least one non-reactive and hydrophilic functional group; and

wherein the surfactant is applied to the superabsorbent material when [the second functional groups on] the surface of the superabsorbent material [are] is activated by increasing the amount of second functional groups available to react at the surface of the superabsorbent material.

2. (Amended) The method of claim 1, wherein the surfactant solution includes a solvent that is a solvent to the surfactant but a non-solvent to the superabsorbent material; and

wherein the surfactant solution includes an amount of water sufficient to [solvate the surface of the superabsorbent material but less than sufficient to cause significant swelling of the superabsorbent material] activate the surface of the superabsorbent material to promote reaction between the first and the second functional groups on the surface of the superabsorbent material.

4. (Amended) The method of claim 1, further comprising washing the treated superabsorbent material with a solvent to selectively remove any fugitive surfactant.

10. (Amended) The method of claim 1, wherein the treated superabsorbent material is a fiber that has a floating time less than 30 seconds and causes a reduction in surface tension of saline less than about 30%.

11. (Amended) The method of claim 1, wherein the treated superabsorbent material is a fiber that causes a reduction in surface tension of saline less than about 25%.

12. (Amended) The method of claim 1, wherein the treated superabsorbent material is a fiber that causes a reduction in surface tension of saline less than about 20%.

21. (Amended) The method of claim 1, wherein the surfactant is applied to the superabsorbent material when the surface of the superabsorbent material is [in a solvated state] sufficiently solvated.

**New Claims 22 and 23 were added.**



**III. Conclusion:**

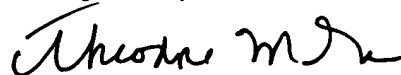
For at least the reasons given above, Applicants submit that Claims 1-7, 10-19 and 21-23 define patentable subject matter. Accordingly, Applicants respectfully request allowance of these claims.

The foregoing is submitted as a full and complete Response to the Office Action mailed October 7, 2002, and early and favorable consideration of the claims is requested.

Should the Examiner believe that anything further is necessary in order to place the application in better condition for allowance, the Examiner is respectfully requested to contact Applicant's representative at the telephone number listed below.

No additional fees are believed due; however, the Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, to Deposit Account No. 11-0855.

Respectfully submitted,



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